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(FILE 'HOME' ENTERED AT 13:05:52 ON 05 NOV 2001)

FILE 'REGISTRY' ENTERED AT 13:06:17 ON 05 NOV 2001

E FELIMG04P/MF

E FE0.8LIMG0.204P/MF

L1 1 S E7

E IRON LITHIUM CALCIUM PHOSPHATE/CN

E IRON LITHIUM PHOSPHATE/CN

L2 1 S E11

E CALCIUM IRON LITHIUM PHOSPHATE/CN

L3 2 S E4 OR E5

FILE 'CAPLUS' ENTERED AT 13:16:51 ON 05 NOV 2001

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L1 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2001 ACS  
RN 331622-62-9 REGISTRY  
CN Iron lithium nickel phosphate (Fe<sub>0.8</sub>LiNi<sub>0.2</sub>(PO<sub>4</sub>)) (9CI) (CA INDEX NAME)  
MF Fe . Li . Ni . O4 P  
AF Fe<sub>0.8</sub> Li Ni<sub>0.2</sub> O4 P  
CI TIS  
SR CA  
LC STN Files: CA, CAPLUS

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Ni	0.2	7440-02-0
Li	1	7439-93-2
Fe	0.8	7439-89-6

1 REFERENCES IN FILE CA (1967 TO DATE)  
1 REFERENCES IN FILE CAPLUS (1967 TO DATE)

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L3 ANSWER 1 OF 2 REGISTRY COPYRIGHT 2001 ACS

RN 349632-88-8 REGISTRY

CN Phosphoric acid, calcium iron(2+) lithium salt (5:1:4:5) (9CI) (CA INDEX NAME)

OTHER NAMES:

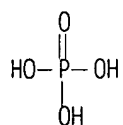
CN Calcium iron lithium phosphate (Ca<sub>0.2</sub>Fe<sub>0.8</sub>Li(P<sub>04</sub>))

MF Ca . 4 Fe . 5 H3 O4 P . 5 Li

SR CA

LC STN Files: CA, CAPLUS

CRN (7664-38-2)



● 1/5 Ca

● 4/5 Fe(II)

● Li

1 REFERENCES IN FILE CA (1967 TO DATE)

1 REFERENCES IN FILE CAPLUS (1967 TO DATE)

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L3 ANSWER 2 OF 2 REGISTRY COPYRIGHT 2001 ACS  
RN 349632-79-7 REGISTRY  
CN Calcium iron lithium phosphate (Ca<sub>0.1</sub>Fe<sub>0.9</sub>Li(P<sub>04</sub>)) (9CI) (CA  
INDEX NAME)  
MF Ca . Fe . Li . 04 P  
AF Ca<sub>0.1</sub> Fe<sub>0.9</sub> Li 04 P  
CI TIS  
SR CA  
LC STN Files: CA, CAPLUS

Component	Ratio	Component Registry Number
04P	1	14265-44-2
Ca	0.1	7440-70-2
Li	1	7439-93-2
Fe	0.9	7439-89-6

2 REFERENCES IN FILE CA (1967 TO DATE)  
2 REFERENCES IN FILE CAPLUS (1967 TO DATE)

09559861

L5 ANSWER 2 OF 2 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:545615 CAPLUS

DOCUMENT NUMBER: 135:109740

TITLE: Preparation of lithium-containing materials for  
battery cathodes

INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L.

PATENT ASSIGNEE(S): Valence Technology, Inc., USA

SOURCE: PCT Int. Appl., 94 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001053198	A1	20010726	WO 2000-US35438	20001222

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,  
CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,  
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT,  
LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU,  
SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN,  
YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,  
DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF,  
BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2000-484919 A1 20000118

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium battery which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in electrochem. cells are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT 349632-79-7P, Calcium iron lithium phosphate (Ca<sub>0.1</sub>Fe<sub>0.9</sub>Li(PO<sub>4</sub>))

RL: DEV (Device component use); SPN (Synthetic preparation); PREP

(Preparation); USES (Uses)

(prepn. of lithium-contg. materials for battery cathodes)

RN 349632-79-7 CAPLUS

CN Calcium iron lithium phosphate (Ca<sub>0.1</sub>Fe<sub>0.9</sub>Li(PO<sub>4</sub>)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Ca	0.1	7440-70-2
Li	1	7439-93-2
Fe	0.9	7439-89-6

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REFERENCE COUNT:

3

REFERENCE(S):

- (1) Barker, J; WO 0001024 A 2000 CAPLUS
- (2) Masquelier, C; US 5910382 A 1999 CAPLUS
- (3) Saidi, M; WO 9812761 A 1998 CAPLUS

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L7 ANSWER 1 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:596464 CAPLUS

TITLE: Crystal chemistry of the olivine-type  
Li(MnyFe<sub>1-y</sub>)PO<sub>4</sub> and (MnyFe<sub>1-y</sub>)PO<sub>4</sub> as possible  
4 V cathode materials for lithium  
batteries

AUTHOR(S): Yamada, Atsuo; Chung, Sai-Cheong

CORPORATE SOURCE: Frontier Science Laboratories, Sony Corporation,  
Yokohama, 240-0036, Japan

SOURCE: J. Electrochem. Soc. (2001), 148(8), A960-A967  
CODEN: JESQAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A potential 4 V cathode material for lithium batteries was investigated. The crystal chem. of the olivine-type of Li(Mny<sub>2</sub>+Fe<sub>1-y2</sub>)PO<sub>4</sub> (discharged state) and its delithiated form (Mny<sub>3</sub>+Fe<sub>1-y3</sub>)PO<sub>4</sub> (charged state) were comparatively studied using X-ray diffraction, Mossbauer spectroscopy, and ab initio calcns. A strong oxidizer, nitronium tetrafluoroborate, NO<sub>2</sub>BF<sub>4</sub>, was used for chem. delithiation of Li(Mny<sub>2</sub>+Fe<sub>1-y2</sub>)PO<sub>4</sub> to obtain (Mny<sub>3</sub>+Fe<sub>1-y3</sub>)PO<sub>4</sub>. The strong electron/lattice interaction induced by the trivalent manganese (3d<sup>4</sup>) in (Mny<sub>3</sub>+Fe<sub>1-y3</sub>)PO<sub>4</sub> (charged state) is highlighted as the intrinsic obstacle to generating the full theor. capacity (ca. 170 mAh/g) of the Mn-rich phase (y > 0.8), followed by an efficient cathode performance of the optimized Li(Mn<sub>0.6</sub>Fe<sub>0.4</sub>)PO<sub>4</sub>.

REFERENCE COUNT: 22

REFERENCE(S): (1) Amine, K; Electrochem Solid-State Lett 2000, V3, P178 CAPLUS  
(2) Andersson, A; Electrochem Solid-State Lett 2000, V3, P66 CAPLUS  
(3) Andersson, A; Solid State Ionics 2000, V130, P41 CAPLUS  
(6) Blyr, A; J Electrochem Soc 1998, V145, P194 CAPLUS  
(7) Ceder, G; Electrochim Acta 1999, V45, P131 CAPLUS  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

09559861

L7 ANSWER 2 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:546963 CAPLUS

DOCUMENT NUMBER: 135:291298

TITLE: A high-rate, long-life, lithium  
nanocomposite polymer electrolyte battery

AUTHOR(S): Croce, F.; Fiory, F. Serraino; Persi, L.; Scrosati, B.

CORPORATE SOURCE: Dipartimento di Chimica, Universita "La Sapienza",  
Rome, 00185, Italy

SOURCE: Electrochem. Solid-State Lett. (2001), 4(8), A121-A123  
CODEN: ESLEF6; ISSN: 1099-0062

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB This paper describes a novel type of rechargeable lithium  
polymer battery based on the combination of a nanocomposite electrolyte  
and a cathode of the phospho-olivine family. The  
results demonstrate features, in terms of power capability and  
cyclability, largely exceeding those so far reported for conventional  
lithium polymer batteries. These unique performances make this  
battery suitable for elec. vehicle application.

REFERENCE COUNT: 12

REFERENCE(S): (1) Appetecchi, G; Electrochim Acta 2000, V45, P1481  
CAPLUS  
(3) Borghini, M; J Electrochem Soc 1995, V142, P2118  
CAPLUS  
(5) Croce, F; J Phys B 1999, V103, P10632 CAPLUS  
(6) Croce, F; Nature 1998, V394, P456 CAPLUS  
(8) Gray, F; Energy Storage Systems for Electronics  
2000, P351 CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT



09559861

7 ANSWER 3 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:526735 CAPLUS

DOCUMENT NUMBER: 135:259711

TITLE: Reaction mechanism of the olivine-type  $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$  ( $0 \leq x \leq 1$ )

AUTHOR(S): Yamada, Atsuo; Kudo, Yoshihiro; Liu, Kuang-Yu

CORPORATE SOURCE: Technical Support Center, Frontier Science Laboratories, Yokohama, 240-0036, Japan

SOURCE: J. Electrochem. Soc. (2001), 148(7), A747-A754

CODEN: JESQAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The charge-discharge reaction mechanism of the olivine-type  $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$  ( $0 \leq x \leq 1$ ), a possible 4 V class cathode material for lithium batteries, was investigated using equil. voltage measurements, X-ray diffraction, Moessbauer spectroscopy, and X-ray absorption spectroscopy. The flat two-phase region with an open-circuit voltage (OCV) of ca. 4.1 V (region I:  $0 \leq x \leq 0.6$ ,  $\text{Mn}^{3+}/\text{Mn}^{2+}$ ) and the S-curved single-phase region with OCV approx. 3.5 V (region II:  $0.6 \leq x \leq 1$ ,  $\text{Fe}^{3+}/\text{Fe}^{2+}$ ) were clearly identified together with the corresponding change in the unit cell dimensions of the orthorhombic lattice. These features show significant differences from the reaction mechanism of  $\text{LiFePO}_4$  ( $0 \leq x \leq 1$ ), in which the whole  $\text{Fe}^{3+}/\text{Fe}^{2+}$  reaction proceeds in a two-phase manner ( $\text{LiFePO}_4$ - $\text{FePO}_4$ ) with a flat voltage profile at 3.4 V.

REFERENCE COUNT: 17

REFERENCE(S): (1) Amine, K; Electrochem Solid-State Lett 2000, V3, P178 CAPLUS

(5) Eventoff, W; Am Mineral 1972, V57, P45 CAPLUS

(6) Mizushima, K; Mater Res Bull 1980, V15, P783 CAPLUS

(7) Padhi, A; J Electrochem Soc 1997, V144, P1188 CAPLUS

(8) Popov, A; J Am Chem Soc 1958, V80, P1340 CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT

09559861

L7 ANSWER 4 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:521189 CAPLUS

DOCUMENT NUMBER: 135:109692

TITLE: Secondary nonaqueous electrolyte lithium  
battery using improved anode and cathode  
materials

INVENTOR(S): Iguchi, Takaaki; Kuratomi, Junichi; Kuwana, Koji

PATENT ASSIGNEE(S): Yuasa Battery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
	JP 2001196061	A2	20010719	JP 2000-6070	20000111
AB	The battery uses fired oxides of $\text{Li}_x\text{Ti}_{5/3-y}\text{O}_4$ (L = elements excluding Ti; $x = 4/3-7/3$ ; $y = 0-5/3$ ) with spinel structure in the anode active mass and fired oxides of $\text{Li}_m\text{MPO}_4$ (M = transition metals; $m = 0-2.1$ ) with olivine structure in the cathode active mass. The battery shows high energy d. and low self-discharge.				

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7 ANSWER 5 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:498294 CAPLUS

DOCUMENT NUMBER: 135:155199

TITLE: Cathode properties of phospho-  
olivine LiMP04 for lithium secondary  
batteries

AUTHOR(S): Okada, S.; Sawa, S.; Egashira, M.; Yamaki, J.-i.;  
Tabuchi, M.; Kageyama, H.; Konishi, T.; Yoshino, A.

CORPORATE SOURCE: IAMS, Kyushu University, Kasuga, 816-8580, Japan

SOURCE: J. Power Sources (2001), 97-98, 430-432

CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science S.A.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Four types of orthorhombic olivine LiMP04 (M:Co, Fe, Ni and Mn)  
were investigated as high-voltage cathode active materials for  
lithium secondary batteries. LiCoP04 exhibited the highest 4.8 V  
discharge plateau of 100 mAh/g vs. Li/Li+ after  
initial charging to 5.1 V and its energy d. was comparable to that of  
layered rock salt LiCoO2 (120 mAh/g.times.4 V=480 mWh/g). In contrast,  
the open circuit voltage profile of LiFeP04 was 160 mAh/g on the 3 V  
plateau. The Co2+ state in LiCoP04 was confirmed using HRXRF.

REFERENCE COUNT: 11

REFERENCE(S): (1) Amine, K; Electrochem Solid State Lett 2000,  
V3(4), P178 CAPLUS  
(3) Fey, G; J Electrochem Soc 1994, V141, P2279 CAPLUS  
(4) Kawai, H; Electrochem Solid-State Lett 1998,  
V1(5), P212 CAPLUS  
(5) Okada, S; Denki Kagaku 1997, V65, P802 CAPLUS  
(6) Padhi, A; J Electrochem Soc 1997, V144, P1188  
CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT

09559861

L7 ANSWER 6 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:280615 CAPLUS

DOCUMENT NUMBER: 134:298399

TITLE: Cathode active mass containing  
lithium iron phosphate and secondary  
lithium battery using it

INVENTOR(S): Takahashi, Masaya; Tobishima, Shinichi; Takei, Koji;  
Sakurai, Yoji

PATENT ASSIGNEE(S): Nippon Telegraph and Telephone Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
-----	----	-----	-----	-----
JP 2001110414	A2	20010420	JP 1999-282445	19991004

AB The cathode mass comprises olivine-structure  
Li Fe phosphate powder represented as  $\text{Li}_2\text{Fe}_{1-y}\text{X}_y\text{PO}_4$  ( $y = 0-0.3$ ;  $0 < z$  .ltoreq. .ltoreq.1;  $X = \text{Mg, Co, Ni, and/or Zn}$ ) carrying a conductive  
powder having redox potential higher than the phosphate powder. The title  
battery is equipped with a cathode contg. the above active mass,  
a Li or Li alloy anode or a Li-intercalating  
anode, and an electrolyte. The battery is obtained at low cost and  
provides high charging-discharging capacity with large current.

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L7 ANSWER 7 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:260632 CAPLUS

DOCUMENT NUMBER: 135:63689

TITLE: Influence of the Structure on the Electrochemical  
Performance of Lithium Transition Metal  
Phosphates as Cathodic Materials in Rechargeable  
Lithium Batteries: A New High-Pressure Form of  
LiMPO<sub>4</sub> (M = Fe and Ni)

AUTHOR(S): Garcia-Moreno, O.; Alvarez-Vega, M.; Garcia-Alvarado,  
F.; Garcia-Jaca, J.; Gallardo-Amores, J. M.; Sanjuan,  
M. L.; Amador, U.

CORPORATE SOURCE: Departamento de Quimica Inorganica y Materiales  
Facultad de Ciencias Experimentales y Tecnicas,  
Universidad San Pablo-CEU, Madrid, 28668, Spain

SOURCE: Chem. Mater. (2001), 13(5), 1570-1576

CODEN: CMATEX; ISSN: 0897-4756

PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Materials built from MO<sub>6</sub> octahedra linked to XO<sub>4</sub> tetrahedra are good candidates for studying the different factors that det. the electrode potential. Among them, olivine-like LiMPO<sub>4</sub> (M = transition metal) phosphates are esp. interesting. When pressure is applied to LiMPO<sub>4</sub> (M = Ni and Fe), a phase transition is induced. However, instead of the well-known olivine spinel transformation, a transition to a new phase is obsd. (.beta.''). The arrangements of the metal ions (including phosphorus) in the two structures are very similar; thus, the main difference between them is due to the oxygen arrangement in a similar matrix. Raman spectroscopy has confirmed the structural model proposed for the high-pressure phase, in particular the modification in the lithium coordination from 6- to 4-fold upon synthesis under pressure. Among the olivines LiMPO<sub>4</sub> (M = Mn, Ni, and Fe), the iron-contg. one is only active up to 5.1 V. On the other hand, none of the high-pressure materials is electrochem. active; this can be explained by the change in the electrostatic field at the transition metal position.

REFERENCE COUNT: 18

REFERENCE(S): (2) Amine, K; Electrochem Solid-State Lett 2000,  
V3(4), P178 CAPLUS

(3) Baur, W; Am Mineral 1972, V57, P709 CAPLUS

(5) Broussely, M; J Power Sources 1999, V81-82, P137  
CAPLUS

(6) Broussely, M; J Power Sources 1999, V81-82, P140  
CAPLUS

(7) Choisnet, J; J Solid State Chem 1982, V45, P280  
CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT

09559861

L7 ANSWER 8 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:225610 CAPLUS

DOCUMENT NUMBER: 134:254632

TITLE: Secondary lithium batteries using  
lithium iron phosphate cathodes

INVENTOR(S): Takahashi, Masaya; Tobishima, Shinichi; Takei, Koji;  
Sakurai, Yoji

PATENT ASSIGNEE(S): Nippon Telegraph and Telephone Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
	JP 2001085010	A2	20010330	JP 1999-261394	19990916
AB	The batteries use $\text{Li}_2\text{Fe}_{1-y}\text{X}_y\text{PO}_4$ ( $0 < z \leq 1$ ; X = element electrochem. stable in 3-4 V potential vs. Li std. potential) having olivine-type structure as the cathode active materials. Preferably, the X is Mg, Co, Ni, and/or Zn. The batteries, capable of charging and discharging at $\leq 4$ V, inhibit decompn. of electrolyte, and show improved discharge capacity and cycling performance.				

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L7 ANSWER 9 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2001:97142 CAPLUS

DOCUMENT NUMBER: 134:283187

TITLE: Cathodes properties of phospho-  
olivine for lithium secondary  
batteries

AUTHOR(S): Okada, Shigeto; Sawa, Shoichiro; Egashira, Minato;  
Yamaki, Junichi

CORPORATE SOURCE: Institute of Advanced Material Study, Kyushu  
University, Japan

SOURCE: Kyushu Daigaku Kino Busshitsu Kagaku Kenkyusho Hokoku  
(2000), 14(2), 133-137  
CODEN: KDBHFS; ISSN: 0914-3793

PUBLISHER: Kyushu Daigaku Kino Busshitsu Kagaku Kenkyusho

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Four types of orthorhombic olivine  $\text{LiMPO}_4$  (M:Co, Fe, Ni, Mn) were investigated as high voltage cathode active materials for lithium secondary batteries.  $\text{LiCoPO}_4$  exhibited the highest 4.8 V discharge plateau of 100 mAh/g vs.  $\text{Li/Li}^+$  after initial charging to 5.1 V and its energy d. was comparable to that of layered rock salt  $\text{LiCoO}_2$  (120 mAh/g  $\times$  4 V = 480 mWh/g). In contrast, the open circuit voltage profile of  $\text{LiFePO}_4$  was 160 mAh/g on the 3 V plateau. TG-DSC measurements showed that the thermal stability of charged  $\text{Li}_{1-x}\text{CoPO}_4$  is better than that of fully-charged  $\text{Li}_{1-x}\text{CoO}_2$ . The chem. state of Co in  $\text{LiCoPO}_4$  was also analyzed using HRXRF.

REFERENCE COUNT: 9

REFERENCE(S): (1) Amine, K; ECS Meeting Abstracts 1999, V99-2(277)  
(3) Fey, G; J Electrochem Soc 1994, V141, P2279 CAPLUS  
(4) Okada, S; DENKI KAGAKU 1997, V65, P802 CAPLUS  
(5) Padhi, A; J Electrochem Soc 1997, V144, P1188  
CAPLUS  
(8) Sigala, C; J Solid State Chem 1997, V132, P372  
CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT

09559861

L7 ANSWER 10 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2000:398840 CAPLUS

DOCUMENT NUMBER: 133:61274

TITLE: Olivine LiMePO<sub>4</sub> (Me: Co, Cu) as 4.8 V and 2 V positive electrodes materials for lithium batteries

AUTHOR(S): Amine, K.; Yasuda, H.; Yamachi, M.

CORPORATE SOURCE: Chemical Technology Division, Argonne National Laboratory, Argonne, 60439-4837, Fr.

SOURCE: Proc. - Electrochem. Soc. (2000), 99-25, 311-325  
CODEN: PESODO; ISSN: 0161-6374

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Reversible extn. and insertion of lithium from olivine LiCoPO<sub>4</sub> at 4.8 V vs. lithium have shown that this material is a good candidate for a high-voltage lithium-ion battery. Electrochem. extn. was limited to 0.64 lithium per formula unit, with a charge capacity of 105 mAh/g and a discharge capacity of 80 mAh/g. In this case, the material retains its structural integrity with a slight contraction of the unit cell upon cycling. The crystallinity of the electrode during charge and discharge processes was not affected, as deduced from the sharpness of the X-ray diffraction peaks of the cycled electrode. However, LiCuPO<sub>4</sub> exhibited a larger unit cell, with orthorhombic symmetry different from that of olivine. In this case, lithium could not be extd., and the material could only be discharged at 2 V giving a large discharge capacity of 600 mAh/g. X-ray diffraction of the fully discharge material showed the formation of Li<sub>3</sub>P<sub>2</sub>O<sub>7</sub> and metallic copper due to a decompn. reaction. The formation of metallic copper could enhance the electronic pathway channel of the electrode during the discharge, making LiCuPO<sub>4</sub> a good cathode for primary batteries.

REFERENCE COUNT: 16

REFERENCE(S): (1) Amine, K; J Power Sources 1997, V68, P604 CAPLUS  
(2) Brandt, K; Solid State Ionics 1994, V69, P173  
CAPLUS  
(3) Ein-Eli, Y; J Electrochem Soc 1997, V144, PL205  
CAPLUS  
(4) Fey, G; J Electrochem Soc 1994, V141, P2279 CAPLUS  
(6) Mizushima, K; Mater Res Bull 1980, V15, P783  
CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT



09559861

L7 ANSWER 11 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2000:182737 CAPLUS

DOCUMENT NUMBER: 132:210149

TITLE: Olivine LiCoPO<sub>4</sub> as 4.8 V electrode material  
for lithium batteries

AUTHOR(S): Amine, K.; Yasuda, H.; Yamachi, M.

CORPORATE SOURCE: Chemical Technology Division, Argonne National  
Laboratory, Argonne, IL, 60439-4837, USA

SOURCE: Electrochem. Solid-State Lett. (2000), 3(4), 178-179  
CODEN: ESLEF6; ISSN: 1099-0062

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Reversible extn. and insertion of lithium from and into  
olivine LiCoPO<sub>4</sub> at 4.8 V vs. lithium have shown that  
this material is a good candidate for a high-voltage lithium-ion  
battery. Electrochem. extn. was limited to 0.42 lithium per  
formula unit, with a charge capacity of 86 mAh/g and a discharge capacity  
of 70 mAh/g. In this case, the material retains its structural integrity  
with a slight contraction of the unit cell upon cycling. The  
crystallinity of the electrode during charge and discharge processes was  
not affected, as deduced from the sharpness of the X-ray diffraction peaks  
of the cycled cathode material.

REFERENCE COUNT: 17

REFERENCE(S): (1) Amine, K; J Power Sources 1997, V68, P604 CAPLUS  
(2) Brandt, K; Solid State Ionics 1994, V69, P173  
CAPLUS  
(3) Ein-Eli, Y; J Electrochem Soc 1997, V144, PL205  
CAPLUS  
(4) Fey, G; J Electrochem Soc 1994, V141, P2279 CAPLUS  
(5) Manthiram, A; J Power Sources 1989, V26, P403  
CAPLUS

ALL CITATIONS AVAILABLE IN THE RE FORMAT

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L7 ANSWER 12 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 1999:498727 CAPLUS

DOCUMENT NUMBER: 131:132296

TITLE: Secondary lithium batteries

INVENTOR(S): Takata, Kazunori; Fujino, Makoto; Iwamoto, Kazuya;  
Kondo, Shigeo

PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 11219722	A2	19990810	JP 1998-21803	19980203
EP 933827	A1	19990804	EP 1999-300758	19990202

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,  
IE, SI, LT, LV, FI, RO

PRIORITY APPLN. INFO.: JP 1998-21803 19980203

AB The batteries use transition metal compd. cathodes having a potential .gtoreq.4.5 V vs. Li and a Li+ conductive sulfide based solid electrolyte. The electrolyte may contain Si atoms connected to bridging O atoms, and the transition metal compd. for the cathodes may have a spinel or olivine structure.

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L7 ANSWER 13 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 1999:307887 CAPLUS

DOCUMENT NUMBER: 130:314395

TITLE: New lithium insertion electrode materials  
based on tetraoxyanions derivatives with  
olivine structure

INVENTOR(S): Simoneau, Martin; Armand, Michel; Choquette, Yves;  
Zaghib, Karim

PATENT ASSIGNEE(S): Hydro-Quebec, Can.

SOURCE: Can. Pat. Appl., 5 pp.  
CODEN: CPXXEB

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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	CA 2200998	AA	19980925	CA 1997-2200998	19970325
AB	A lithium insertion-type pos. electrode materials having an olivine structure based on iron or manganese derivs., whose general formula is: $\text{Li}_x\text{-yM}_1\text{-(y+d+t+q+r)DdTtQqRr[PO}_4\text{]}_1\text{-(p+s+v)[SO}_4\text{]}_p\text{[SiO}_4\text{]}_s\text{[VO}_4\text{]}_v$ where: M represents Fe <sup>2+</sup> or Mn <sup>2+</sup> or mixts. thereof; D represents a metal in the +2 oxidn. state, chosen among: Mg <sup>2+</sup> , Ni <sup>2+</sup> , Co <sup>2+</sup> , Zn <sup>2+</sup> , Cu <sup>2+</sup> , Ti <sup>2+</sup> ; T represents a metal in the +3 oxidn. state, chosen among: Al <sup>3+</sup> , Ti <sup>3+</sup> , Cr <sup>3+</sup> , Fe <sup>3+</sup> , Mn <sup>3+</sup> , Ga <sup>3+</sup> , Zn <sup>2+</sup> , V <sup>3+</sup> ; Q represents a metal in the +4 oxidn. state, chosen among: Ti <sup>4+</sup> , Ge <sup>4+</sup> , Sn <sup>4+</sup> , V <sup>4+</sup> . R represents a metal in the +5 oxidn. state, chosen among: V <sup>5+</sup> , Nb <sup>5+</sup> , Ta <sup>5+</sup> . All M, D, T, Q, R, are elements residing in octahedral sites; v is the stoichiometric coeff. for V <sup>5+</sup> residing in tetrahedral sites. The stoichiometric coeffs. x, y, d, t, q, r, p, s, v are all comprised between zero and one with at least one among of the y, d, t, q, r, p, s and v coeffs. differing from zero. Other conditions are: $0 \leq x \leq 1$ , $y + r + d + t + q + r \leq 1$ , $p + s + v \leq 1$ , $3 + s - p =$ $x - y + t + 2q + 3r$ where x is the degree of intercalation during operation of the electrode material.				

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L7 ANSWER 14 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 1999:72205 CAPLUS

DOCUMENT NUMBER: 130:170706

TITLE: Lithium mixed oxide cathode active materials, cathodes using the materials, and lithium batteries using them

INVENTOR(S): Amine, Khalil

PATENT ASSIGNEE(S): Japan Storage Battery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 22 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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	JP 11025983	A2	19990129	JP 1997-215424	19970704
AB	The active materials comprise $\text{LiM}_{11}\text{-xM}_2\text{xPO}_4$ ( $\text{M}_1 = \text{Co, Ni, Mn}$ ; $\text{M}_2 = \text{Mg, Fe, Ni, Co, Mn, Zn, Ge, Cu, Cr}$ ; $x = 0\text{-}0.5$ ) having the olivine structure. The materials, which may have a rhombic structure, may be (1) $\text{LiMnPO}_4$ with lattice parameters of $a = 6.11 \pm 0.50 \text{ \AA}$ , $b = 10.46 \pm 0.50 \text{ \AA}$ , and $c = 4.73 \pm 0.50 \text{ \AA}$ , (2) $\text{LiNiPO}_4$ with lattice parameters of $a = 5.86 \pm 0.50 \text{ \AA}$ , $b = 10.07 \pm 0.20 \text{ \AA}$ , $c = 4.68 \pm 0.50 \text{ \AA}$ , or (3) $\text{LiCoPO}_4$ having lattice parameters of $a = 5.92 \pm 0.50 \text{ \AA}$ , $b = 10.21 \pm 0.50 \text{ \AA}$ , and $c = 4.70 \pm 0.50 \text{ \AA}$ . Cathodes using the materials and batteries using the cathodes, electrolyte solns., and anode active materials contg. Li, Li alloys, $\text{Li}_x\text{SnO}_2$ , and C materials are also claimed. Li batteries with high energy d. and high voltage are obtained.				

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L7 ANSWER 15 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 1997:399650 CAPLUS

DOCUMENT NUMBER: 127:37234

TITLE: Nonaqueous electrolyte secondary batteries with alkali metal-contg. iron mixed oxide cathodes

INVENTOR(S): Okada, Shigeto; Arai, So; Masashiro, Takahisa; Otsuka, Hideaki; Sakurai, Yoji; Yamaki, Junichi

PATENT ASSIGNEE(S): Nippon Telegraph and Telephone Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 7 PP.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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	JP 09134725	A2	19970520	JP 1995-311699	19951107
AB	The battery cathodes contain the Fe mixed oxide $AyFeXO_4$ (A = alkali metal; X = Group IV-VII element, $0 < y < 2$ ) as an active mass. The mixed oxide preferably has olivine structure with hexagonal closest-packing O skeleton or spinel or reverse spinel structure with cubic closest-packing O skeleton. The batteries have high discharge voltages and high capacity.				

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L7 ANSWER 16 OF 18 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 1997:305747 CAPLUS

DOCUMENT NUMBER: 126:345317

TITLE: Phospho-olivines as positive-electrode materials for rechargeable lithium batteries

AUTHOR(S): Padhi, A. K.; Nanjundaswamy, K. S.; Goodenough, J. B.

CORPORATE SOURCE: Center for Materials Science and Engineering, The University of Texas at Austin, Austin, TX, 78712-1063, USA

SOURCE: J. Electrochem. Soc. (1997), 144(4), 1188-1194

CODEN: JESQAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Reversible extn. of lithium from  $\text{LiFePO}_4$  (triphylite) and insertion of lithium into  $\text{FePO}_4$  at 3.5 V vs. lithium at 0.05 mA/cm<sup>2</sup> shows this material to be an excellent candidate for the cathode of a low-power, rechargeable lithium battery that is inexpensive, nontoxic, and environmentally benign. Electrochem. extn. was limited to  $\sim 0.6$  Li/formula unit; but even with this restriction the specific capacity is 100 to 110 mAh/g. Complete extn. of lithium was performed chem.; it gave a new phase,  $\text{FePO}_4$ , isostructural with heterosite,  $\text{Fe}_{0.65}\text{Mn}_{0.35}\text{PO}_4$ . The  $\text{FePO}_4$  framework of the ordered olivine  $\text{LiFePO}_4$  is retained with minor displacive adjustments. Nevertheless the insertion/extn. reaction proceeds via a two-phase process, and a reversible loss in capacity with increasing c.d. appears to be assocd. with a diffusion-limited transfer of lithium across the two-phase interface. Electrochem. extn. of lithium from isostructural  $\text{LiMPO}_4$  (M = Mn, Co, or Ni) with an  $\text{LiClO}_4$  electrolyte was not possible; but successful extn. of lithium from  $\text{LiFe}_{1-x}\text{Mn}_x\text{PO}_4$  was accomplished with max. oxidn. of the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  occurring at  $x = 0.5$ . The  $\text{Fe}^{3+}/\text{Fe}^{2+}$  couple was oxidized first at 3.5 V followed by oxidn. of the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple at 4.1 V vs. lithium. The  $\text{Fe}^{3+}$ -O-Mn<sup>2+</sup> interactions appear to destabilize the Mn<sup>2+</sup> level and stabilize the Fe<sup>3+</sup> level so as to make the Mn<sup>3+</sup>/Mn<sup>2+</sup> energy accessible.

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L7 ANSWER 17 OF 18 CAPLUS COPYRIGHT 2001 ACS  
ACCESSION NUMBER: 1974:20695 CAPLUS  
DOCUMENT NUMBER: 80:20695  
TITLE: Cathode-ray tube containing a luminescent  
silicate screen  
PATENT ASSIGNEE(S): N. V. Philips' Gloeilampenfabrieken  
SOURCE: Fr. Demande, 11 pp.  
CODEN: FRXXBL  
DOCUMENT TYPE: Patent  
LANGUAGE: French  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
FR 2147110	A1	19730309	FR 1972-26415	19720721
FR 2147110	B1	19771230		
NL 7110248	A	19730126	NL 1971-10248	19710724
NL 160599	B	19790615		
DE 2233382	A1	19730201	DE 1972-2233382	19720707
DE 2233382	C3	19790118		
DE 2265403	B1	19800103	DE 1972-2265403	19720707
DE 2265403	C2	19800904		
US 3855143	A	19741217	US 1972-271833	19720714
CA 1000045	A1	19761123	CA 1972-147340	19720718
AU 7244765	A1	19740124	AU 1972-44765	19720720
GB 1334838	A	19731024	GB 1972-34224	19720721
IT 963260	A	19740110	IT 1972-27294	19720721
AT 315254	B	19740527	AT 1972-6298	19720721
DK 130095	B	19741216	DK 1972-3630	19720721
JP 51002313	B4	19760124	JP 1972-72615	19720721
SE 383066	B	19760223	SE 1972-9633	19720721
CH 585784	A	19770315	CH 1972-10930	19720721
BE 786655	A1	19730124	BE 1972-120195	19720724
BR 7204925	A0	19730614	BR 1972-4925	19720724
ES 405094	A1	19750716	ES 1974-405094	19740722
US 3943400	A	19760309	US 1974-502150	19740830
PRIORITY APPLN. INFO.:			NL 1971-10248	19710724
			US 1972-271833	19720714

AB A luminescent silicate for cathode-ray tubes in flying-spot  
scanners has the formula  $\text{Li}_{1-x}\text{Na}_x\text{Y}_1\text{-pCe}_p\text{SiO}_4$ , where  $0.50 \leq x \leq 0.80$  and  $0.002 \leq p \leq 0.10$ , and has the  
olivine crystal structure. These silicates have persistence times  
 $\leq 100$  nsec. and show practically no phosphorescence. Thus, a mixt.  
of  $\text{SiO}_2$  2.548,  $\text{Y}_2\text{O}_3$  0.98,  $\text{CeO}_2$  4.628,  $\text{LiCl}$  0.084,  $\text{Li}_2\text{CO}_3$  0.59,  
and  $\text{Na}_2\text{CO}_3$  1.272 g was heated in air for 2 hr at  $1100^\circ\text{C}$ , cooled,  
crushed, and heated again for 2 hr at  $1070^\circ\text{C}$  in a reducing atm.  
contg.  $\text{CO}$ . The silicate obtained was  $\text{Li}_{0.4}\text{Na}_{0.6}\text{Y}_{0.99}\text{Ce}_{0.01}\text{SiO}_4$  having the olivine structure. The persistence  
time under electron excitation is 80 nsec.

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ACCESSION NUMBER: 1963:419941 CAPLUS

DOCUMENT NUMBER: 59:19941

ORIGINAL REFERENCE NO.: 59:3554h,3555a-b

TITLE: Electrolytic recovery of metallic magnesium from its fused silicates

INVENTOR(S): Labounski, Alex

PATENT ASSIGNEE(S): University Laboratories, Inc.

SOURCE: 3 pp.

DOCUMENT TYPE: Patent

LANGUAGE: Unavailable

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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US 3093558		19630611	US	19600802
FR 1367594			FR	

AB Mg is sepd. as molten metal from minerals such as olivine and serpentine by electrolysis of fused salts contg. cations, such as Na, K, Li, Ca, and Al, more electropos. than Mg, in which the Mg minerals are dissolved, in the presence of a reducing agent, such as a graphite crucible, and under an inert atm. The minerals are prepd. by crushing and calcining. An Fe rod dipping into the bath may serve as anode, and the molten Mg liberated at the C cathode may be collected by an Fe sheet, sprinkled with KCl for protection, and led into a sep. container for skimming and alloying. Sludge and ore residues are tapped out from the bottom of the bath at 8-hr. intervals, with Mg removed every 2 hrs. Suitable salt baths contain KCl 22-30, cryolite 6-15, CaCl<sub>2</sub> up to 4, and NaCl or LiCl up to .apprx.2 parts by wt., for addns. of 3 parts 100-mesh Mg minerals. With 2-3 amp. at 2-5 v. for 35-45 min. at 800-980.degree. in graphite crucibles, about 45-80% recoveries were estd., with 60-75% expected for larger-scale operations. The metal purity should be sufficient for most com. alloys without remelting.